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10/580,422	05/24/2006	Anne-Marie Caminade	1004900-000276	1713

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EXAMINER

DOLLINGER, MICHAEL M

ART UNIT	PAPER NUMBER
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1766

NOTIFICATION DATE	DELIVERY MODE
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02/03/2011

ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

ADIPFDD@bipc.com
offserv@bipc.com

Office Action Summary	Application No. 10/580,422	Applicant(s) CAMINADE ET AL.	
	Examiner MIKE DOLLINGER	Art Unit 1766	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 24 January 2011.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 60-64,66-79,81-87,89-91 and 119-145 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 60-64,66-77,79,81-87,89-91,119,120,122-128,130-134,136-140 and 143 is/are rejected.
- 7) ☒ Claim(s) 78,121,129,135,141,142,144 and 145 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

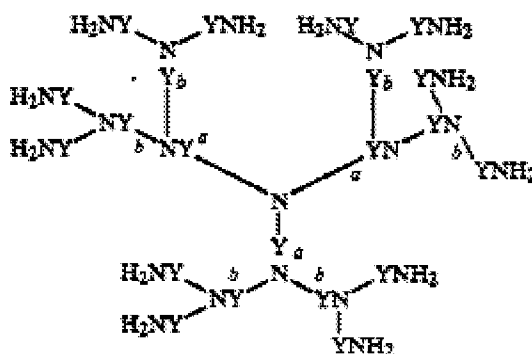
DETAILED ACTION
Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

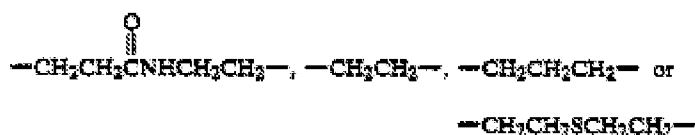
A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

1. Claims 66-68, 77, 85-87, 90, 91, 120, 122-126, 128, 130-134 and 136-140 are rejected under 35 U.S.C. 102(b) as being anticipated by Killat et al (US 4,871,779).
2. Killat et al. disclose dense star polymers (column 2 lines 26-27) with at least one dendritic branch (column 2 line 27), at least two terminal ion exchange moieties on each dendritic branch (column 2 lines 28-29) that is preferably phosphonate or phosphonium (column 6 lines 58-61). Before adding the terminal groups, the dendrimers have the structure:



wherein Y represents a divalent amide moiety such as



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The above dendritic polymers may have a PAMAM (polyamidoamine) structure (the leftmost moiety for Y), a ternary or trivalent core molecule, and second generation dendritic branches (column 10 lines 15-18). The phosphonic terminals can be added through the direct reaction of the -NH_2 ends of the dendrons with chloromethylphosphonate (column 7 lines 19-24). This dendritic polymer would have a core valence of 3 or 4 and a generation of 2. The nitrogen atoms at the end of each generation chain may also be substituted with a hydrogen atom [claim 17; column 22 lines 2, 9].

3. Regarding claims 66 and 131, the phosphonate groups are used as ion exchange groups [column 6 lines 58-61]. The terminal anionic groups (phosphonic groups) of the cation exchange dendrimers are neutralized with stoichiometric amounts of alkali metal hydroxide [column 5 lines 55-58] which results in a phosphonate group with an alkali metal cation. The alkali metal hydroxide used in the examples is sodium hydroxide [Example 8]. Furthermore, one having ordinary skill in the art would have immediately envisaged sodium hydroxide, potassium hydroxide and all other alkali metal hydroxides from the disclosure of "alkali metal hydroxide".

4. Regarding the structure of 90, this polymer (with the leftmost Y moiety above and a hydrogen atom on the nitrogens) would have the structure wherein A' is ethylene, B' is ethylene, R is hydrogen, L' is methylene, and X is H or an alkali metal cation.

5. Regarding the structure of claim 91, this polymer (with one of the alkylene groups as the Y moiety above and a hydrogen atom on the nitrogens) would have the structure

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wherein A" is an ethylene or propylene, L" is a methylene and X is H or an alkali metal cation.

6. Regarding claim 128, the core of the dendrimer may be ethylene diamine or butylene diamine [claim 18; column 22 lines 18-29].

7. Regarding claim 133, Killat disclose a dendrimer with generation G=3 [col 8 line 2].

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

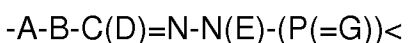
8. Claims 60-64, 69-76, 79, 81-84, 89 and 143 are rejected under 35 U.S.C. 103(a) as being unpatentable over Caminade et al (FR 2734268 A1) hereinafter referred to as Caminade '268.

9. Caminade '268 discloses, in Examples 4-6, 11 and 12, several dendrimers with phosphonic terminals. The Examples include 10-generational [Examples 4-6] and 4-generational [Examples 11 and 12] with PMMH generational chains [Figures 1 and 2]. The ultimate generation reads on the intermediate chains of the claims. The PMMH chains read on the generational chains of claims 69-76 wherein A represents an oxygen atom, B represents a phenyl radical, D represents a hydrogen atoms, E represents a methyl radical, and G represents a sulfur radical [Figures 1 and 2; page 24 lines 13].

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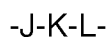
The core molecule is $S=P\equiv$ radical [page 24 lines 6-9]. Caminade '268 discloses that the core molecule may be derived from $O=PCl_3$, $S=PCl_3$ or $P_3N_3Cl_6$ [page 15 lines 23-26] which reads on the core molecule of claim 63.

10. Regarding claims 69-76, applicants claim generation branch compositions elected from linear or branched hydrocarbon chains having from 1 to 12 chain members wherein the generation chains are of the formula:



wherein in the most limited embodiments A represents an oxygen atom; B represents a substituted or unsubstituted phenyl ring; D represents a hydrogen atom; E represents a radical alkyl; and G represents a sulfur atom. Caminade'268 disclose the structure [Figures 1, 2, 6 and 13] having the same formula as represented above wherein A is an oxygen atom; B is an aryl group namely phenylene; C is a carbon atom; D is an hydrogen atom; E is an alkyl radical namely methyl; and G is a sulfur atom.

11. Regarding claims 81-84, applicants claim the intermediate chains, which are identical or different, as represented by the formula:

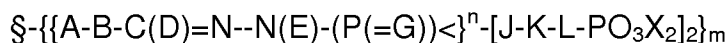


wherein J represents an oxygen atom, a sulfur atom or a radical $-NR-$; K represents a radical $-Aryl-$, $-Heteroaryl-$, or $-Alkyl-$ and most limited to an unsubstituted phenyl; L represents a hydrocarbon chain having from 1 to 6 chain members optionally having one or more heteroatoms. Caminade '268 disclose the structure in FIG. (XI) (column 38) having the same formula as represented above wherein J is an oxygen atom; K is a

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radical aryl namely a phenylene group; and L is a four membered hydrocarbon chain with N and P heteroatoms.

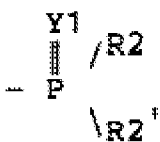
12. Regarding claim 89, applicants claim a dendritic polymer with a core, generation and intermediate chains, and phosphonic terminals in the formula:



wherein all variables are as defined above. Caminade '268 disclose dendritic polymers with a core of hexachlorocyclotriphosphazene or trichlorothiophosphane [page 15 lines 23-26] generation or intermediate chains described in paragraphs 22 and 23 of this office action, and phosphonic terminals.

13. Caminade '268 does not disclose the specific terminal groups of claims 60.

Regarding the terminal groups, Caminade '268 discloses terminal groups of the formula:



[page 49 lines 5-8]

wherein Y1 includes oxygen [page 50 line 8] and R2 and R2' include alkoxy groups [page 49 lines 30-32]. Specific Examples 11 and 12 include phosphonic groups wherein R2 and R2' are ethoxy groups. The compound of Caminade '268 differs from the claimed dendrimer only in the presence of ethyl phosphonate terminal groups as opposed to methyl phosphonate terminal groups. One having ordinary skill in the art at the time the invention was made would have expected the dendrimers of the prior art and the claimed dendrimers to have similar if not equivalent properties based on the structural similarities of the two compounds. A *prima facie* case of obviousness may be

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made when chemical compounds have very close structural similarities and similar utilities. "An obviousness rejection based on similarity in chemical structure and function entails the motivation of one skilled in the art to make a claimed compound, in the expectation that compounds similar in structure will have similar properties." In *re Payne*, 606 F.2d 303, 313, 203 USPQ 245, 254 (CCPA 1979). See In *re Papesch*, 315 F.2d 381, 137 USPQ 43 (CCPA 1963) and In *re Dillon*, 919 F.2d 688, 16 USPQ2d 1897 (Fed. Cir. 1991). Compounds which are position isomers (compounds having the same radicals in physically different positions on the same nucleus) or homologs (compounds differing regularly by the successive addition of the same chemical group, e.g., by -CH₂- groups) are generally of sufficiently close structural similarity that there is a presumed expectation that such compounds possess similar properties. In *re Wilder*, 563 F.2d 457, 195 USPQ 426 (CCPA 1977). See also In *re May*, 574 F.2d 1082, 197 USPQ 601 (CCPA 1978).

14. Claims 119 and 127 are rejected under 35 U.S.C. 103(a) as being unpatentable over Killat et al (US 4,871,779) in view of Tomalia (US 4,507,466).

15. Killat does not disclose a core molecule for the dendritic polymers which contains a phosphorus atom. Killat does disclose core molecules including polyamines such as ammonia, ethylene diamine and diethylenetriamine [claim 18].

16. Tomalia describes several functionalized dendritic polymers with the same branch structures as Killat [cols 5-6]. Tomalia disclose several core compounds which include ammonia [col 7 line 4], ethylenediamine [col 7 lines 48], phosphine [col 7 line

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54] and diethylenetriamine [col 7 line 55]. Tomalia discloses, henceforth, that phosphine (a phosphorus containing molecule), ammonia, ethylene diamine and diethylenetriamine are functionally equivalent as core molecules for the purpose of preparing amine based dendritic polymers. It would have been obvious to one having ordinary skill in the art to substitute phosphine for ammonia, ethylene diamine or diethylenetriamine in the dendrimer of Killat because it is *prima facie* obvious to substitute art-recognized functional equivalents known for the same purpose, see MPEP § 2144.06.

Allowable Subject Matter

17. Claims 78, 121, 129, 135, 141, 142, 144 and 145 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

18. The following is a statement of reasons for the indication of allowable subject matter: Killat and Caminade '268, discussed above, represent the closest prior art and do not arrive at the claimed inventions.

19. Regarding claim 78, 135, 141, 142, 144 and 145, neither Caminade '268 or Killat disclose a combination of the specific combination of generational and intermediate chains with a dimethyl phosphonate terminal of claim 78 nor is there any suggestion or motivation to prepare a dendrimer of this particular combination. The terminal groups of Killat cannot be modified to contain dimethyl phosphonate groups because these would

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not perform the intended uses of the dendrimers, namely ion exchange and chelate resins.

20. Regarding claims 121 and 129, while the claimed core molecule is disclosed in the prior art, e.g. in Caminade '268 and Majoral et al (US 6,969,528), there is no disclosed motivation to change the amine based core of Killat to the claimed phosphorous based core. Nor is there motivation to change the generation or intermediate chains of Caminade '268 to those of claims 121 and 129. Both of these modifications of the prior art are non-trivial, would effect the chemical and physical properties of the dendrimers (such as solubility and ion exchange capacities) and would require significant adjustment to the disclosed preparation of the dendrimers.

Response to Arguments

21. Applicant's arguments filed 01/24/2011 with respect to Killat et al (US 4,871,779) have been fully considered but they are not persuasive.

22. Applicants argue that Killat discloses star polymers with at least one dendritic branch emanating from a core, with each dendritic branch having at least two terminal ion exchange moieties [col 2 lines 25-30]. Applicants argue that the instant claims differ because the dendrimers contain only one terminal group for each intermediate branch. This argument is not convincing. The claims do not require "only one terminal group for each generation branch" but rather "only one terminal group for each intermediate branch". Killat requires at least two terminal groups per "core branch" corresponding to the first generation of dendritic branches. It is well within the teachings of Killat for each

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final dendritic branch to have only one terminal group. Actually, it is the specifically mentioned by Killat: The phosphonic terminals can be added through the direct reaction of the -NH_2 ends of the dendrons with chloromethylphosphonate (column 7 lines 19-24). This dendritic polymer would have a core valence of 3 or 4 and a generation of 2. The nitrogen atoms at the end of each generation chain may also be substituted with a hydrogen atom [claim 17; column 22 lines 2, 9].

23. Applicant's arguments filed 01/24/2011 with respect to Caminade et al (FR 2734268 A1) have been fully considered but they are not persuasive.

24. Applicants argue that Caminade '268 does not disclose the terminal groups of the formula $\text{-P(=O)(CH}_3)_2$. Applicants cite their own specification, which states that it has heretofore been impossible prepare dendrimers with phosphonic acid terminals starting from the corresponding alkyl ester. This argument is not convincing. Applicants interpretation of the prior art is correct; the terminal groups of the formula $\text{-P(=O)(CH}_3)_2$ are not explicitly disclosed. However, as discussed in the now rejection above, the claimed terminal groups are obvious over the disclosed terminal of the formula $\text{-P(=O)(C}_2\text{H}_5)_2$. Applicants are incorrect, however, in arguing that it has heretofore been impossible to synthesize a dendritic polymer with phosphonic acid functional terminal groups starting from the alkyl ester groups, in fact this is the reaction used in Caminade [see at least Example 11] as well as Killat [see the 35 USC 102 rejection above].

25. Applicants also argue that there would not have been a reasonable expectation of success in using the methyl ester phosphonate in place of the ethyl ester

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phosphonate terminals because one having ordinary skill in the art would know that methyl ester and ethyl esters can differ significantly in terms of reactivity and physical properties. This argument is not convincing. It is unclear whether Applicants are arguing that one would not have a reasonable expectation that the methyl esters would not react to form the dendrimer or that one would not have a reasonable expectation that the methyl ester terminated dendrimers would have similar properties to the ethyl ester terminated dendrimers. In either case, one would have a reasonable expectation of success for two reasons:

26. Firstly, the broad disclosure of Caminade refers to alkyl esters of the phosphonic acids, see the rejection above for citations, which encompasses methyl and ethyl (and from which one would at once envisage methyl esters).

27. Secondly, as is generally known in the chemical arts and supported by the MPEP as stated in the rejection above, compounds that differ only in the length of an alkyl chain are most often similar in chemical and physical properties. Applicants are correct in stating that the ethyl and methyl esters *can* differ significantly, but Applicants have not argued that there is any *predictable* or *expected* significant difference between the two. If they are so obviously different, Applicants should argue the specific differences or even cite prior art references that disclose them as significantly different. A *prima facie* case of obviousness is based upon a preponderance of evidence and the general disclosure of alkyl esters combined with the reasonable expectation that the methyl ester will be similar to the ethyl ester is more convincing than Applicants argument that

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there is a seldom or even rare occurrence in chemistry that methyl esters differ significantly from ethyl esters.

28. Applicants argue that the terminal group cited by Examiner contains an oxygen group between the intermediate chain and the phosphorous atom of the terminal group whereas the terminal group of the claims is directly bonded to the intermediate chain. This argument is not convincing. Firstly, the intermediate chains of the claims may end in an oxygen group and therefore attach to the phosphonic terminals through an oxygen, so the oxygen of the cited terminal group can be considered part of the intermediate chain. Secondly, in the same passage, Caminade cites the more general phosphonic terminals with no oxygen atom attached to the phosphonic group. The rejection above has been modified to cite this terminal. This is not a new grounds of rejection, but rather broadening the grounds of rejection that has already been presented in order to put it in terms preferred by Applicants.

Conclusion

This is an RCE. All claims are drawn to the same invention claimed in the earlier application and could have been finally rejected on the grounds and art of record in the next Office action if they had been entered in the earlier application. Accordingly, **THIS ACTION IS MADE FINAL** even though it is a first action in this case. See MPEP § 706.07(b). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

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A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no, however, event will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MIKE DOLLINGER whose telephone number is (571)270-5464. The examiner can normally be reached on M-F 9-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Randy Gulakowski can be reached on 571-272-1302. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/mmd/

/Marc S. Zimmer/
Primary Examiner, Art Unit 1765